

R E M A R K S

Reconsideration of this application, as amended, is respectfully requested.

THE SPECIFICATION

The specification has been amended to correct some minor informalities of which the undersigned has become aware. No new matter has been added, and it is respectfully requested that the amendments to the specification be approved and entered.

THE DRAWINGS

It is respectfully submitted that the drawings filed with the application papers on June 22, 2006, are formal drawings, and it is respectfully requested that the Examiner indicate the drawings as being accepted in the next Office Action.

THE CLAIMS

Claim 1 has been amended to recite subject matter of (now canceled) claim 2, as well as to make some minor grammatical improvements and to correct some minor antecedent basis problems so as to put same in better form for issuance in a U.S. patent.

In addition, new claims 9 and 10 have been added to recite preferred nozzle diameter ranges as supported by the disclosure

in the specification at, for example, page 51, line 22, and page 53, line 19.

No new matter has been added, and it is respectfully requested that the amendments to the claims be approved and entered.

THE PRIOR ART REJECTION

Claims 1, 3, 4 and 7 were rejected under 35 USC 103 as being obvious in view of the combination of USP 5,477,249 ("Hotomi") and USP 6,017,112 ("Anderson et al"); and claims 2, 5, 6 and 8 were rejected under 35 USC 103 as being obvious in view of the combination of Hotomi, Anderson et al and USP 6,382,754 ("Morikoshi et al"). These rejections, however, are respectfully traversed with respect to the claims as amended hereinabove.

The claimed present invention is directed to a liquid jetting apparatus which causes an electrically charged droplet to be ejected with electrostatic force. More specifically, according to the present invention as recited in amended independent claim 1, a liquid ejection apparatus is provided which comprises a liquid ejection head having a nozzle with an inner diameter of at most 15 μm , an ejection voltage supply to apply an ejection voltage to a solution inside the nozzle so as to charge the solution, a convex meniscus generator to cause the solution inside the nozzle to rise from the nozzle in a convex shape, and

an operation controller to control application of a drive voltage to drive the convex meniscus generator and application of the ejection voltage by the ejection voltage supply so that the drive voltage to the convex meniscus generator is applied in timing overlapped with the application of a pulse voltage as the ejection voltage by the ejection voltage supply. In addition, as recited in amended independent claim 1, the operation controller controls a voltage having a reversed polarity to the ejection voltage to be applied to the solution inside the nozzle just before or just after the ejection voltage is applied to the solution inside the nozzle.

With the structure of the present invention as recited in amended independent claim 1, the conventional problems of the electro-wetting effect, excessive concentration of particle substance, and the influence of charge-up are canceled or balanced out. In addition, with the structure of the present invention as recited in amended independent claim 1, it becomes possible to control a next jetting to be implemented in a proper state, unaffected by the previous jetting. See the disclosure in the specification at, for example, page 12, line 17, to page 13, line 7.

With respect to the cited prior art, it is respectfully submitted that Morikoshi et al is silent with respect to electrostatic force and electrically charging ink droplets, and

that this reference only discloses utilizing a signal waveform of a voltage to drive a piezoelectric vibrator 9 to jet droplets.

In addition, it is respectfully submitted that the drive voltage to drive the piezoelectric vibrator 9 shown in Figs. 5(e) and 6 of Morikoshi et al does not at all correspond to the reversed voltage of the claimed present invention. The drive voltage shown in Figs. 5(e) and 6 of Morikoshi et al merely corresponds to an electric power applied to a piezoelectric vibrator 9 in order to drive the piezoelectric vibrator 9. See column 6, lines 31-37 of Morikoshi et al.

By contrast, the voltage having a reversed polarity to the ejection voltage as recited in amended independent claim 1 is of an electric potential applied to the solution in the nozzle to charge the solution. Accordingly, it is respectfully submitted that Morikoshi et al does not disclose, teach or even suggest applying a voltage having a reversed polarity to the ejection voltage to a solution inside a nozzle just before or just after an ejection voltage is applied to the solution inside the nozzle.

And it is respectfully submitted that since Morikoshi et al does not even teach applying any voltage to the solution as according to the claimed present invention, the advantageous effects of overcoming the conventional problems of the electro-wetting effect, excessive concentration of particle substances and influence on charge-up, which are caused by

charging a solution by applying voltage thereto, are not achieved by the ink jet printing device of Morikoshi et al.

Still further, it is noted that the drive voltage applied to the piezoelectric vibrator 9 in Morikoshi et al does not reverse in polarity. Specifically, the waveform of Figs. 5(e) and 6 in Morikoshi et al only shows pulses higher and lower than a certain reference voltage, and does not show any pulse with reversed polarity. As indicated in Fig. 18(a) of Morikoshi et al, the driving voltage is always above 0 volt, and the waveform thereof does not go below the 0 volt line. That is, the polarity of the driving voltage is not reversed.

For this reason also, the above mentioned advantages of the claimed present invention, which are achieved applying a voltage of reversed polarity, are not achieved by the ink jet printing device of Morikoshi et al.

It is respectfully submitted, moreover, that Hotomi and Anderson et al also do not disclose, teach or suggest applying a voltage having a reversed polarity to the ejection voltage to a solution inside a nozzle just before or just after an ejection voltage is applied to the solution inside the nozzle, as according to the present invention as recited in amended independent claim 1.

Accordingly, it is respectfully submitted that even if the teachings of Hotomi, Anderson et al and Morikoshi et al were

combinable in the manner suggested by the Examiner, the above described structural features and advantageous effects of the present invention as recited in amended independent claim 1 would still not be achieved or rendered obvious.

In view of the foregoing, it is respectfully submitted that amended independent claim 1, and claims 3, 4, 7, 9 and 10 depending therefrom, clearly patentably distinguish over the cited references, taken singly or in any combination consistent with the respective fair teachings thereof, under 35 USC 103.

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Entry of this Amendment, allowance of the claims and the passing of this application to issue are respectfully solicited.

If the Examiner has any comments, questions, objections or recommendations, the Examiner is invited to telephone the undersigned for prompt action.

Respectfully submitted,

/Douglas Holtz/

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